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PENSOFT

New records of *Passiflora* L. (Passifloraceae) species from Maranhão state and northeastern Brazil

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Abstract

We present here new records of *Passiflora* (Passifloraceae *sensu stricto*) species from Maranhão state, Brazil: *P. cincinnata* Mast., *P. picturata* Ker Gawl., and *P. vespertilio* L. This is the first report of occurrence of *P. vespertilio* to northeastern Brazil. Our data reinforces the need for more collections in Maranhão, as the great environmental richness of the state is not yet sufficiently studied.

Keywords

Distribution; new occurrences; passion flower; taxonomy.

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Introduction

The family Passifloraceae Juss. ex Roussel sensu stricto, especially *Passiflora* L., occurs mainly in tropical regions and has well-known species from the Brazilian flora (Mondin et al. 2011, Araújo and Alves 2013, BFG 2015). Some of these species also have high ethnobotanical interest (Costa Neto 2008), due mainly to their exotic flowers and leaf shape diversity (Abreu et al. 2009), such as *Passiflora alata* Curtis, *P. antioquiensis* H. Karst., *P. caerulea* L., *P. cincinnata* Mast., *P. edulis* f. flavicarpa Degener., *P. foetida* L., *P. incarnata* L., and *P. quadrangularis* L. (Crochemore 2003, D'Eeckenbrugge 2003, Nunes and Queiroz 2001). Additionally, numerous (currently > 330) hybrids are continually produced (Ulmer and MacDougal 2004, Abreu et al. 2008). Aside from *Passiflora*, other genera of Passifloraceae also occur in Brazil, namely *Ancistrothyrsus* Harms, *Dilkea* Mast., and *Mitostemma* Mast. (Araújo and Alves 2013, BFG 2015).

Currently, 19 species of *Passiflora* are known from Maranhão state, Brazil (Flora do Brasil 2020 [2017]). Research on the Passifloraceae s.s. in Maranhão is scarce and limited to localized surveys and reports of new occurrences (Koch et al. 2014, Silva et al. 2016, Mezzonato-Pires et al. 2017).

Information on the flora of Maranhão, which is composed of representatives from the Amazon, Cerrado, and Caatinga biomes, is still meager and fragmented; most studies concern local floristics and/or ethnobotany (Silva et al. 2016). This is justified due to the wide variety of environments in Maranhão, which include cer-

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rados, babassu-palm forest formations, and large forests. According to Rizzini (1997), Maranhão is located in a region of transition between the Cerrado and the Amazon rainforest, but it also has some elements of the Caatinga biome. In that sense, babassu-palm forests are vegetation complexes that form an ecotone between those areas, in agreement with anthropic conditions and associated with capoeira (secondary) vegetation.

We contribute to the knowledge on the Passifloraceae s.s. by reporting the first known occurrences of 3 species from Maranhão state, northeastern Brazil.

Methods

We made expeditions in Maranhão state to develop a list of the Flora of Maranhão, collecting species at various sites in the municipalities of Caxias, Codó (eastern Maranhão) and Mirador (at Mirador State Park, southern Maranhão). Collected specimens were deposited in HABIT herbarium (Maranhão State University, Caxias Campus, Caxias, Brazil), and HENAC herbarium (Federal University of Maranhão, Codó Campus, Brazil). Additional specimens were located using the virtual online database speciesLink (http://splink.cria.org.br/).

Additional the geographical distribution of species was obtained by using specialized literature (Killip 1938, Cervi 1997, Milward-de-Azevedo et al. 2012) and by consulting the databases speciesLink (http://splink.cria.org.br/), Tropicos (http://www.tropicos.org/), and Flora do Brasil 2020 (http://floradobrasil.jbrj.gov.br/). We analyzed voucher specimens from the virtual information systems: HDELTA, HST, HUEFS, MG, MO, and UFRN (acronyms following Thiers, B. 2017). The taxonomic literature used to confirm species identities were Killip (1938), Cervi (1997), Ulmer and MacDougal (2004), and Milward-de-Azevedo et al. (2012).

We present a brief morphological description of the species and include also photographs, comments, and a map of their distribution in Maranhão. The Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using the Geospatial Conservation Assessment Tool GeoCAT (2017). The conservation status of taxa was assessed following the IUCN (2017) criteria.

Results

Passiflora cincinnata **Mast.** Gard. Chron. 1868: 966. Figure 1A, B

Climbing vine, rarely pilose; stem subangular. Stipules linear-subulate, ca 0.8 cm long, with glands along the margin. Petioles 2.3–3.5 cm long, with one pair of sessile glands below the median portion. Leaves 3–5-lobed; middle lobe 6.5–9 × 2.8–4.2, lateral lobe 4.5–6.5 × 2.5–3 cm, serrate, glandular margins. Peduncle robust, 5.2–6 cm long. Bracts verticillate, 2.8–3.2 × 1.2–2.4 cm, ovoid, concave. Flowers solitary; sepals and petals oblong-lanceolate, 1.6–4.2 × 0.5–1.4 cm, blue-violet on the inner surface and green on the outer surface; corona multiseriate, with purple-violet and blue bands, filaments of the outer series 3.5–4 cm long and of the inner series smaller, with varied sizes; limen cupuliform; operculum membranous and filamentous; androgynophore ca 1.3 cm long; ovary globose. Fruit not observed.

Examined specimens. Brazil. Maranhão: Caxias, Área de Proteção Ambiental do Buriti do Meio, trail margin, 04°54′28″ S, 043°06′47″ W, fl., 11-I-2013, N.A. Sampaio 01 (HABIT 538); Área de Proteção Permanente do riacho Lamego, IFMA, 04°49′18″ S, 043°20′38″ W, fl., 20-I-2013, E.O. Silva 22 (HENAC 149).

Additional examined specimens. Brazil. Maranhão: Araióses, Ilha do Cajú, 02°53′24″ S, 041°54′11.2″ W, fl., 30-VII-2001, R.S. Nascimento 38 (HDELTA 2488); São Félix de Balsas, road margin, 07°04′58″ S, 044°48′47″ W, fl., 23-I-2005, A.M. Miranda et al. 4717 (HST 12636, HUEFS 96992, UFRN 2797).

Passiflora cincinnata (*P.* subg. *Passiflora*) can be recognized in the field by its 5-lobed leaves, petioles with 2 larger glands, and larger purple to violet flowers. In the study area, this species was found forming dense populations on forest edges, alongside road margins, and at in anthropicized sites.

Passiflora picturata **Ker Gawl.** Bot. Reg. 8: t. 673. 1822. Figure 1C

Climbing vine, glabrous. Stem terete. Stipules semi-ovate, 1.3–1.6 × 0.6–1.2 cm, aristate. Petioles 1.4–2.4 cm long, with 2–6 elongated glands. Leaves 3-lobed, middle lobe 3.4–5.2, lateral lobe 2.8–3.9 cm long. Peduncle robust, 4.7–4.9 cm long. Bracts petiolate, verticillate, 2.8–3.2 × 2–2.4 cm, elliptic. Flowers solitary; sepals and petals oblong, 1.4–2.3 × 0.9–1.3 cm, pinkish or purple on the inner surface; corona biseriate, with white and violet bands, filaments of the outer series 0.8–1.2 cm long and of the inner series ca 0.5 cm long; limen adnate to the androgynophore; operculum filamentous; androgynophore ca 0.9 cm long; ovary ovoid. Fruit globose.

Examined specimens. Brazil. Maranhão: Caxias, Corrente, cerrado vegetation, 04°51′32″ S, 043°21′22″ W, fl., 30-I-1993, L.P. Felix s/n. (UPCB 24675); Área de Proteção Ambiental Municipal do Inhamum, trail margin, 04°53′27″ S, 043°24′52″ W, fl., 28-XII-2012, D.A. Sousa 06 (HABIT 718); Mirador, Mirador State Park, road margin, 06°37′9.5″ S, 045°52′7.6″ W, fr., 5-II-2016, E.O. Silva 25 (HENAC 158).

Passiflora picturata (*P.* subg. *Passiflora*) can be recognized by its petiolate bracts, which are an exclusive character to the species; and by its petioles with 1–3 pairs of glands, 5-lobed leaves, ovate lobes with purplish abaxial surface, and semi-ovate aristate stipules. In the study site, individuals occurred isolated in the forest interior, always at shady sites.

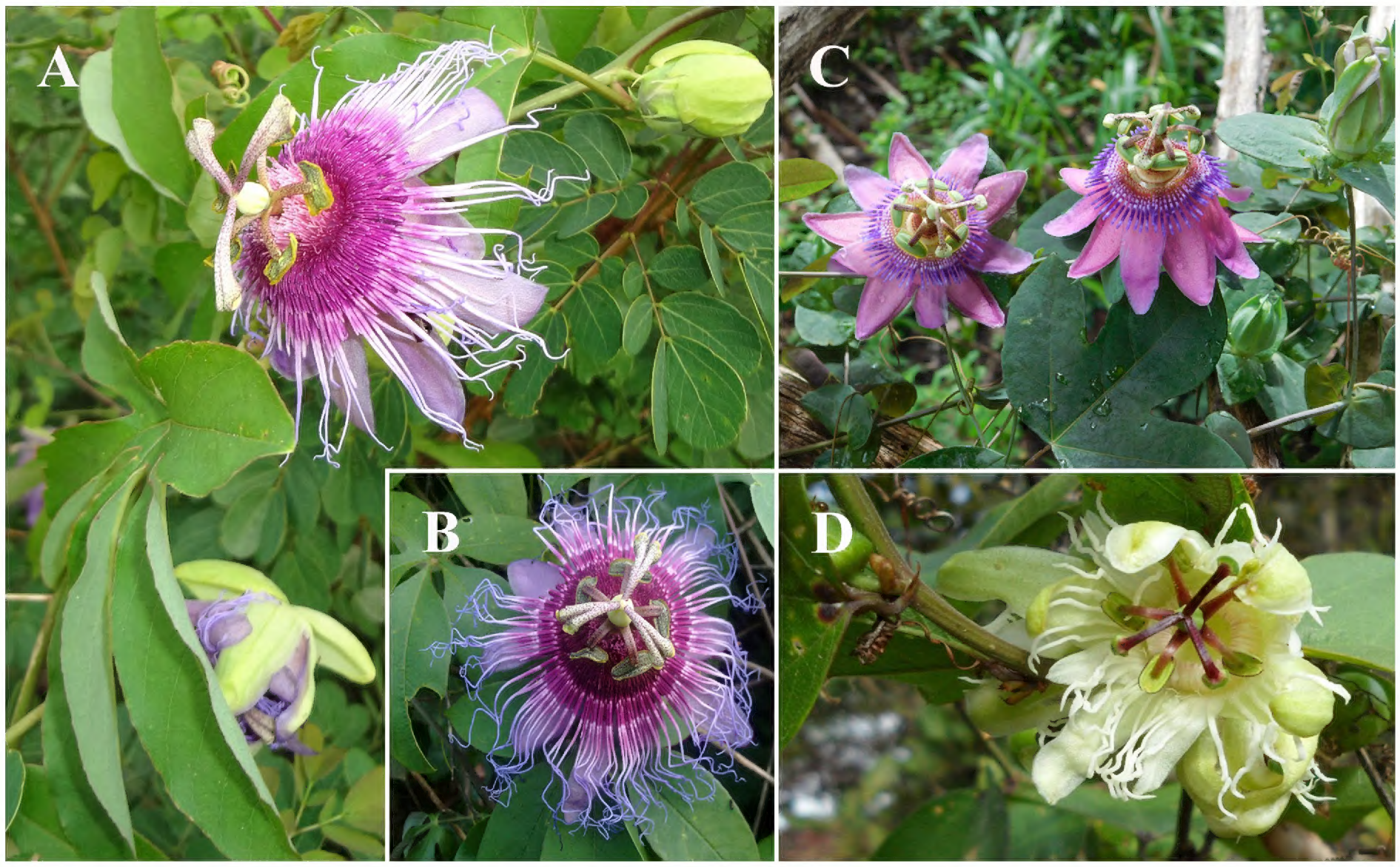

Figure 1. *Passiflora cincinnata* (**A, B**), *Passiflora picturata* (**C**) and *Passiflora vespertilio* (**D**).

***Passiflora vespertilio* L.** Sp. Pl. 2: 957. 1753
Figure 1D

Climbing vine, glabrous to slightly pubescent. Stem subangular or flat. Stipules linear-subulate, 0.3–0.6 cm long. Petioles 1–1.5 cm long, without glands. Leaves 2-lobed, distance between the lobes ranging from 8.6–11 cm long, lateral veins 5.1–8.3 cm long, midrib 3.2–5.2 cm long, ocelli present on the abaxial surface. Peduncles 0.5–0.8 cm long. Bracts linear, ca 0.4 cm long, inserted below the middle of the peduncle. Flowers solitary, small; sepals and petals oblong, 1–1.8 × 0.6–1 cm, white to yellowish green; corona biseriate, white, filaments of the outer series 1–1.2 cm long and of the inner series ca 0.5 cm long, limen annular, cupuliform; operculum membranous; androgynophore ca 0.7 cm long; ovary ovoid. Fruit globose.

Examined specimens. Brazil. Maranhão: Caxias, Área de Proteção Ambiental do Buriti do Meio, trail margin, 04°54′28″ S, 043°06′47″ W, fl., 27-XII-2013, N.A. Sampaio 06 (HABIT 545); Codó, gallery forest, 04°30′07″ S, 043°49′28″ W, fl., 25.I.2016, E.O. Silva 24 (HENAC 157).

Additional examined specimens. Brazil. Maranhão: Carolina, Ilha dos Botéis, 07°16′ S, 047°32′ W, fl., 24-V-1950, J.M. Pires & G.A. Black 2009 (MO 100208540); São Luís, Anil, near river margins, 02°36′ S, 044°14′ W, fr., 3-VI-1907, A. Ducke s/n, (MG 528).

Passiflora vespertilio (*P.* subg. *Decaloba* (DC.) Rchb.) can be recognized mainly by its flat stem, absence of glands on the petiole, bilobed leaves, ocelli on leaf blades, and small white flowers. Flowers in this species are minute, in contrast with the much larger flowers of *P. picturata* and *P. cincinnata*. Additionally, we also observed that flowers of *P. vespertilio* do not open fully and that the outer filaments of the corona are united by a membrane.

We observed this species in the interiors of forests, at sites with dense vegetation, and in wet, shady areas. This is the first report of this species to northeastern Brazil.

Discussion

Plant cover in the sites where we collected these species is composed predominantly of Cerrado vegetation. In municipalities of Caxias and Codó, there are also babassu-palm forests and gallery forests along several rivers that cut through the region. In Mirador State Park, several physiognomies occur, such as Cerrado, Cerradão, Veredas, and riparian forests formed mainly by buriti palms. The park contains springs of the Itapecuru river, one of the major rivers in Maranhão state. Our other collection sites (São Luís and Araióses municipalities) have typical coastal vegetation of Restinga and mangroves; Carolina municipality, on the other hand, is covered by Cerrado vegetation, as it is located on a typical plateau.

Passiflora cincinnata (*P.* subg. *Passiflora*) is widely distributed across South America. In Brazil (Fig. 2) this species occurs in the states of Pará, Tocantins, Goiás, Mato Grosso, Mato Grosso do Sul, São Paulo, Paraná, Rio Grande do Sul, Minas Gerais, Piauí, Ceará, Rio Grande do Norte, Pernambuco, Paraíba, Sergipe, Alagoas, and Bahia (Cervi 1997, BFG 2015, SpeciesLink 2017). This species grows on acidic, sandy soils (Deginani 2001),

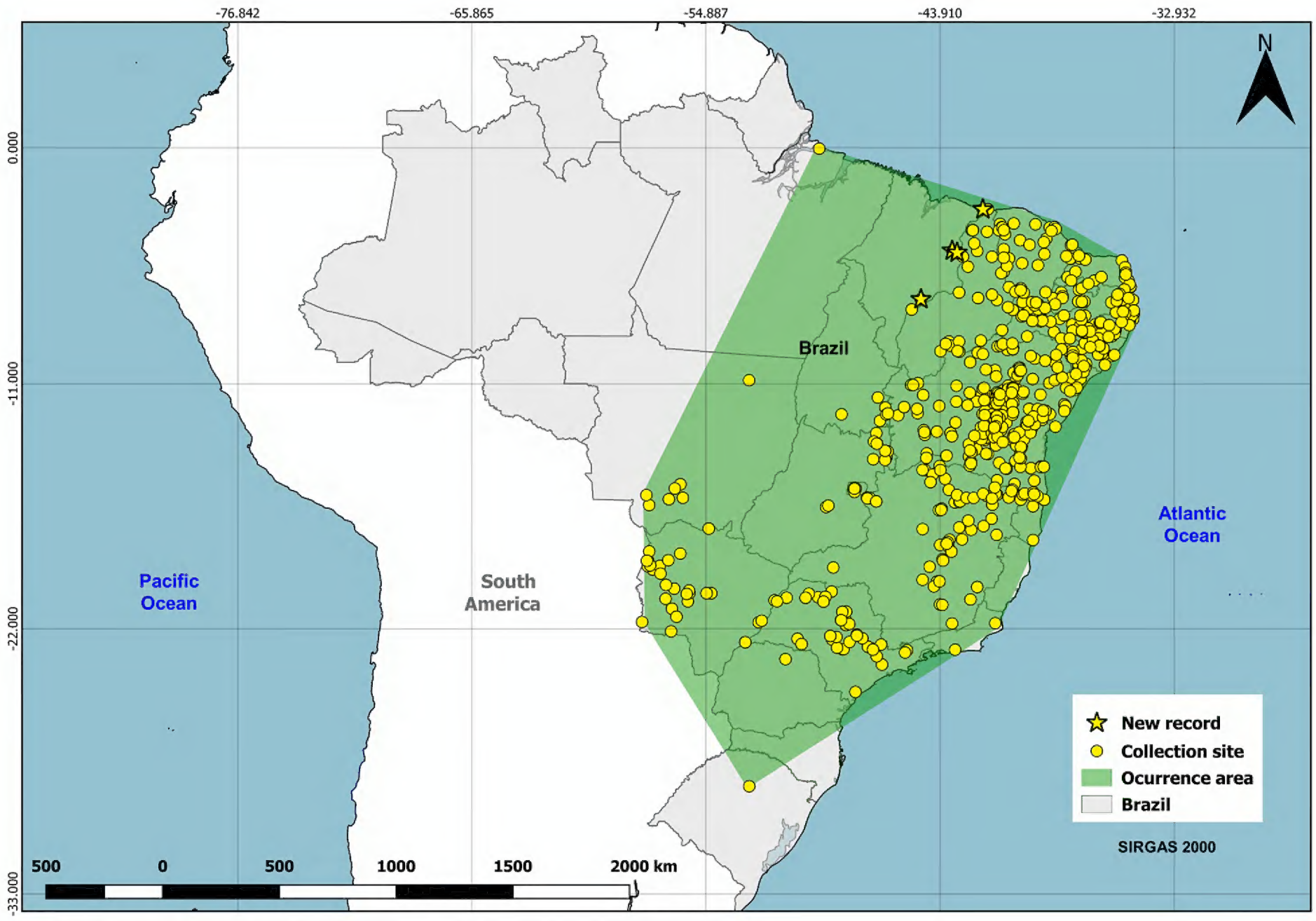

Figure 2. Geographical distribution of *Passiflora cincinnata* in Brazilian territory.

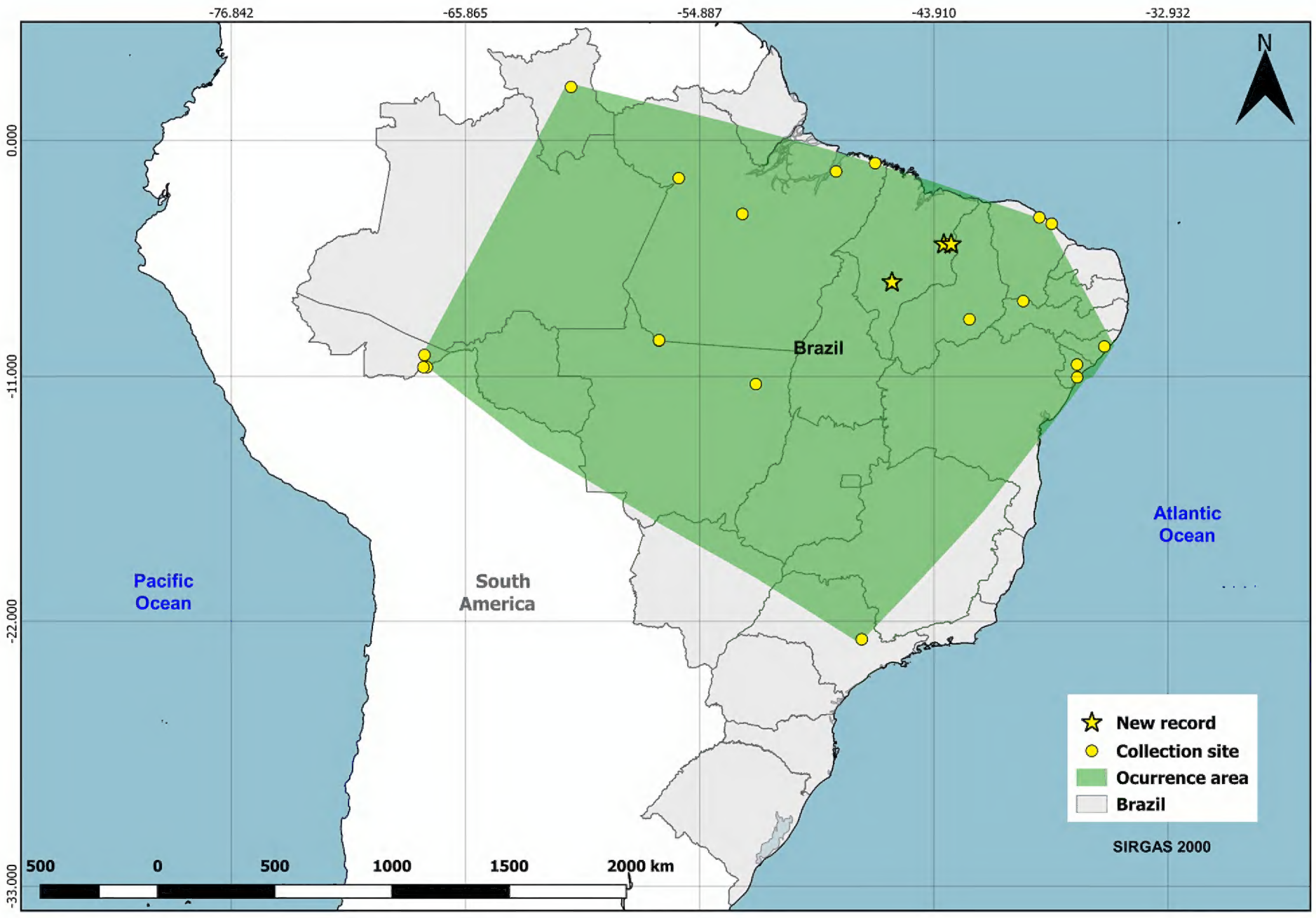

Figure 3. Geographical distribution of *Passiflora picturata* in Brazilian territory.

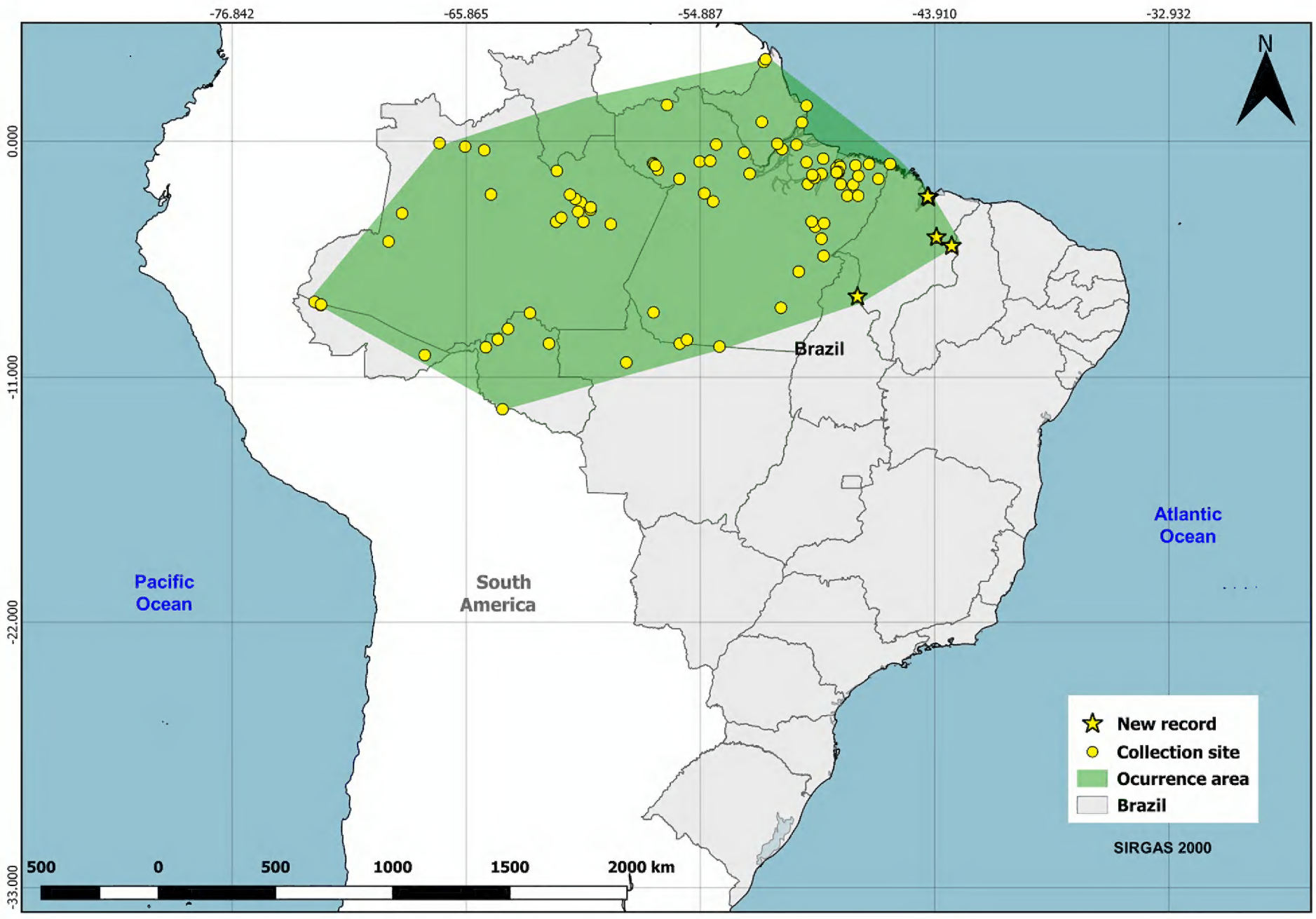

Figure 4. Geographical distribution of *Passiflora vespertilio* in Brazilian territory.

which may explain its frequent occurrence and distribution on rocky outcrops, caatingas, seasonal forests, and cerrados (Nunes and Queiroz 2006).

Passiflora picturata is widely distributed across the Brazilian states (Fig. 3) of Acre, Rondônia, Roraima, Pará, Piauí, Ceará, Alagoas and São Paulo (Cervi 1997, SpeciesLink 2017). It also occurs in Colombia and Suriname. Individuals are usually found in the interior and on the edges of primary and secondary forests (Cervi 1997).

Passiflora vespertilio is a typical species from the Amazon rainforest, occurring in French Guiana, Suriname, Guyana, Venezuela, Ecuador, Peru, Colombia, Bolivia, and Brazil. In Brazil (Fig. 4), the species occurs in the states of Acre, Amazonas, Rondônia, Mato Grosso, Pará, and Amapá, in rainforest vegetation under fluvial influence, such as lowland and igapó forests, as well as in non-flooded vegetation (Milward-de-Azevedo et al. 2012).

Using GeoCAT (Bachman et al. 2011), based on 1180 collections of *P. cincinnata* representing 797 localities, including the new record reported herein, we estimated an EOO of 4,871,169 km² and an AOO of 2,588 km². Although this species has a considerable distribution, its AOO is close to the threshold considered for Vulnerable (< 2,000 km², B2). Considering 30 collections of *Passiflora picturata*, representing 21 localities, we estimated an EOO of 5,868,634 km² and an AOO of 88 km². From the analysis of 124 collections of *Passiflora vespertilio*, representing 86 localities, we obtained an EOO of 3,569, 277 km² and an AOO of 372 km². In the state of Maranhão *P. picturata* and *P. vespertilio* occur in areas with extensive deforestation, where we observed few individuals in reproductive condition, and can be attributed to them the preliminary status of Endangered, under criteria B2ab(ii).

With this study, we extend the distributions of 3 *Passiflora* species in Brazil, which adds 3 more species to the list of *Passiflora* occurring in Maranhão state.

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Authors' Contributions

EOS, NASS and DADS collected and photographed the plants. EOS and MAMDA identified the specimens, wrote the text, and revised herbarium collections. GMDC revised the text.

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